A Synopsis on

Antidiabetic activity of *Berberis aristata* bark and *Hamelia patens* stem in combination

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By

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INTRODUCTION

Diabetes mellitus is a persistent metabolic disorder that afflicts millions of people worldwide. It is characterized by high levels of blood-sugar (glucose) in the blood, which can lead to a range of health problems if left untreated. The condition occurs when the body is unable to produce sufficient insulin, which is a hormone that regulates blood sugar levels, or when the body is unable to use insulin effectively.

Insulin is produced from the pancreas gland, located behind the stomach. It helps to transport glucose from the blood into cells, where it is used for energy. In diabetes, this process is disrupted, resulting in high blood glucose that can damage various organs and tissues in the body.

There are two types of diabetes: diabetes 1st type and diabetes 2nd type. Both types of diabetes are chronic conditions that affect the way the body processes glucose, leading to high blood sugar levels. However, they have different causes, symptoms, and treatment options.

Diabetes 1st Type:

Diabetes 1st type (insulin-addicted diabetes), also known as juvenile (immature) diabetes, is an autoimmune disorder that usually develops in childhood or adolescence. In 1st type diabetes, the body's immune system wrongly attacks and it destroys the insulin-secreting cells from the pancreas, called beta cells. Resulting, people with 1st type diabetes have few or no insulin in their bodies, which means that they need to take insulin injection and use an insulin pump to help manage their blood sugar levels.

The symptoms of 1st type diabetes can develop quickly and may include excessive thirst and hunger, increased urination, vision disorders, tiredness, and unexpected weight loss. Treatment for 1st type diabetes involves regular blood sugar monitoring, insulin therapy, and a healthy diet and lifestyle.

Diabetes 2nd Type:

Diabetes 2nd type (noninsulin-addicted diabetes) is the most common form of diabetes, accounting for around 90% of all such cases. It usually develops in adulthood and is caused by the combination of hereditary and existence factors, including obesity, physical inactivity, and poor diet. In 2nd type diabetes, the body still being able to generate insulin, but it may not be enough or body may not be able to use it effectively. This leads to high blood glucose that can cause a range of health issues, including cardiac disease, stroke, kidney problem, and neurological damage.

The symptoms of 2nd type diabetes can develop slowly and may include excessive thirst and hunger, repeated micturition, hazy vision, weakness, and the slow healing of injuries. Treatment for 2nd type diabetes typically involves lifestyle modifications, such as healthy diets, repeated exercise, and maintain healthy body weight, as well as drugs or insulin therapy. Regular blood glucose examining is also important to prevent complications and maintain optimal health.

Apart from 1st type and 2nd type diabetes, there are several other types of diabetes, including onset diabetes, which occurs during pregnancy, and neonatal diabetes, which is caused by a single gene mutation resulting birth defects. However, 1st type and 2nd type diabetes are most frequent and well-recognized types of diabetes.

Diabetes is detected by the blood investigations that determine the level of glucose in the blood. Diabetes therapy depends on what type and seriousness of the condition, but generally includes lifestyle modifications, such as healthy food, regularly exercise, and maintain a healthy weight, as well as medications or insulin therapy. Regular check of sugar levels in the blood is also essential to avoid difficulties and maintain optimal health

I) *Berberis aristata*

- **Family:** Berberidaceae
- **Common Names:**

  Hindi: Daruhaldi, Jharihaldi

  English: Indian Berberi and Tree Turmeric

  Sanskrit: Dariharida, Darvi, Peetita, Kamini, Katankateri, Hemakanta, Nisha

  Tamil Nadu: Mara Manzal

  Telugu: Mani Pasupa

  Malayalam: Maramanjal
- **Parts used:** Bark, Root, Stem, Fruit and Wood.
- **Habitat:** Found in Himalayan region, distributed from Kashmir to Uttarakhand.

A member of the Berberidaceae family, Berberis aristata is often referred to as Indian Barberry or Tree Turmeric. It is native to the Himalayas and can be found in India, Nepal, Bhutan, and Pakistan. The plant grows up to 3 meters in height and has thorny branches, yellow flowers, and red berries. The bark of the plant is the most commonly used part for medicinal purposes.

Berberis aristata has a long history of use in traditional medicine. Berberine, one of its many active ingredients, has been demonstrated to have antimicrobial, anti-inflammatory, antioxidant, and antidiabetic properties. Numerous medical conditions, such as digestive problems, respiratory infections, skin conditions, and diabetes, are treated with the plant.

In Ayurvedic medicine, Berberis aristata is used to treat diabetes and related complications. By improving insulin sensitivity and encouraging glucose uptake by the cells, it is thought to help control blood sugar levels. The plant is also used to treat skin disorders, such as eczema and psoriasis, as well as urinary tract infections and diarrhea.

Berberis aristata is also used in culinary applications, particularly in the preparation of chutneys and pickles. The berries of the plant are tart and acidic, and are often used as a substitute for lemon juice or vinegar in cooking. The plant is also used as a natural dye, producing a yellow color that is used in textiles and food products.

II) *Hamelia patens*

- **Family:** Rubiaceae

- **Common Names:**
  Hindi: Hamelia
  English: Scarlet Bush and Redhead.
  Other name: Firebush and Hummingbird Bush.

- **Parts used:** stem, leave, flower and fruit.

- **Habitat:** This is native to the American subtropics and tropics. Its distribution ranges from Florida in the southern United States to as far south as Argentina.

Hamelia patens, also known as scarlet bush, Firebush, or Hummingbird bush, is a tropical shrub or small tree that belongs to the Rubiaceae family. It is originally from southern Mexico, Central America, and South America, but has also been introduced to other parts of the world, including Florida, the Caribbean, and Africa. The plant grows up to 6 meters in height and has bright red-orange flowers that attract hummingbirds and other pollinators.

Hamelia patens has a long history of use in traditional medicine. The plant contains several active compounds, including flavonoids, alkaloids, and terpenoids, which have been shown to have antimicrobial, anti-inflammatory, antioxidant, and antidiabetic properties. The plant is used for treating a variety of health conditions, involving respiratory infections, indigestion, skin diseases and diabetes.

In traditional medicine, Hamelia patens is used to treat diabetes and related complications. It is believed in regulating sugar levels in the blood by increasing insulin resistance and promoting glucose uptake by the cells. The plant is also used to treat skin disorders, such as eczema, psoriasis, and dermatitis, as well as respiratory infections, such as colds, coughs, and asthma.

Hamelia patens is also used in landscaping and gardening, particularly in tropical and sub-tropical areas. The plant is valued for its bright red-orange flowers, which attract hummingbirds and butterflies. It is also used as a hedge or screen plant, and can be grown as a container plant or bonsai. Additionally, the plant is used in the traditional African medicine as a treatment for various ailments, involving diarrhea, fever, and malaria.

AIM AND OBJECTIVES

The aim of this study is to investigate the hypoglycemic activity of a combination of Berberis aristata bark and Hamelia patens stem in animal models of diabetes. The study aims to achieve the following objectives:

- To determine the phytochemical composition of Berberis aristata bark and Hamelia patens stem extracts
- To assess the acute toxicity of the extracts in animal models.
- To evaluate the antidiabetic activity of the extracts individually and in combination using animal models of the diabetic.
- To determine the impact of the extracts on glucose metabolism, insulin sensitivity, and lipid profile in diabetic animals.
- To study the mechanism of action of the extracts in regulating glucose in the blood and insulin sensitivity.
- To compare the antidiabetic activity of the combination of Berberis aristata bark and Hamelia patens stem with standard antidiabetic drugs.
- Overall purpose of the study is to offer scientific data for the traditional use of Berberis aristata bark and Hamelia patens stem in the management of diabetes and to identify potential novel therapeutics for the cure of diabetes. Research will also contribute to the understanding of the mechanism of action of these plants in regulating blood glucose levels and improving insulin sensitivity.

REVIEW OF LITERATURE

Several studies have investigated the antidiabetic activity of Berberis aristata bark and Hamelia patens stem extracts individually. However, there is limited research on the combination of these two plants in the management of diabetes.

Berberis aristata has been shown to have antidiabetic properties. The active compound, berberine, has been shown to enhance insulin sensitivity, blood sugar uptake by the cells, and reduce blood sugar in animal models of diabetes. In clinical studies, berberine has also been found to improve glycemic control, lipid profile, and reduce cardiac risk factors in patients with 2^{nd} type diabetes. The bark extract of Berberis aristata has also been shown to have antioxidant and anti-inflammatory properties, which may contribute to its antidiabetic activity.

Hamelia patens has also been found to have antidiabetic properties. The plant extract has been proven to reduce glucose concentration, enhance insulin sensitivity, and increase blood sugar uptake by the cells in animal models of diabetes. The active compounds in Hamelia patens, including flavonoids and alkaloids, have been found to have antioxidant and anti-inflammatory properties, which may also contribute to its antidiabetic activity.

There is limited research on the combination of Berberis aristata bark and Hamelia patens stem extracts in the management of diabetes. However, a study conducted in 2014 found that a combination of these two plants had a synergistic effect in reducing glucose concentration and improving the lipid induced diabetic rats. The study also found that the combination was well-tolerated and did not cause any adverse effects.

Overall, the available literature suggests that Berberis aristata and Hamelia patens have potential as natural antidiabetic agents. The combination of these two plants may have a synergistic effect in improving glycemic control and lipid profile in diabetes. However, further research is required to determine the optimum dosing and duration of treatment and to investigate the mechanism of action of the combination.

PLAN OF WORK

- **Collection and Authentication of the plant:**
  *Berberis aristata (*Family: *Berberidaceae*)

  Hamelia patens (Family: *Rubiaceae*)

- **Preparation of the extract:**
  Berberis aristata Bark and Hamelia patens Stem in Combination.

- **Chemical and reagent:**
  Alloxan, Glibenclamide, Glucose estimation kit, Triglyceride estimation kit,

- **Animals Used:**
  Male Albino Wister Rats (150-250g)

- **Acute Toxicology:**
  According to OECD (Organization for Economic Cooperation and Development) guideline no. 425, a toxicology study will be conducted.

- **Induction of Diabetes:**
  Streptozotocin (STZ, 69%) and alloxan (31%) are by far the most commonly used medications, and this model has been helpful for researching a variety of disease-related topics. When taken parenterally, either intravenously, intraperitoneally, or subcutaneously, both medications have a diabetogenic effect.

- **Experimental design of antidiabetic activity:**
  Male Albino Wister rats (weighing between 150 and 250 g) will be separated into seven groups of six, each of which received a different treatment.

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